California Regional PM10/PM2.5 Air Quality Study

Chemical Mass Balance Modeling Issues

San Joaquin Valleywide Air Pollution Study Agency

Preparation for Receptor Modeling

- Collection of useful data
- Analysis of site and episode characteristics
- Chemical and physical analysis of filters
- Identification of source profiles
- Identify goal of receptor modeling
- Prepare inputs, assumptions
- Run model
- Examine results / Refine and rerun

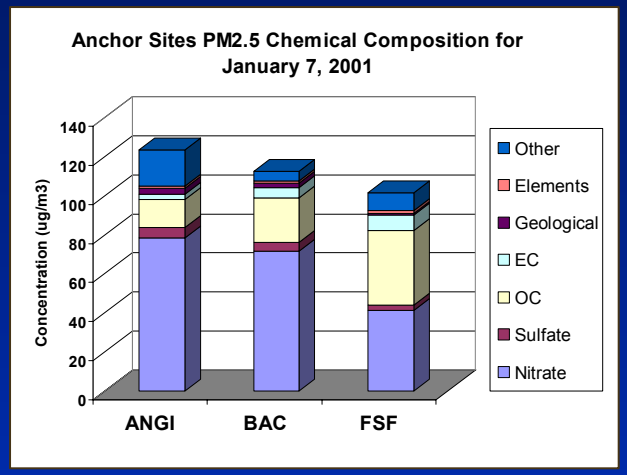
CRPAQS
Collection of Useful Data

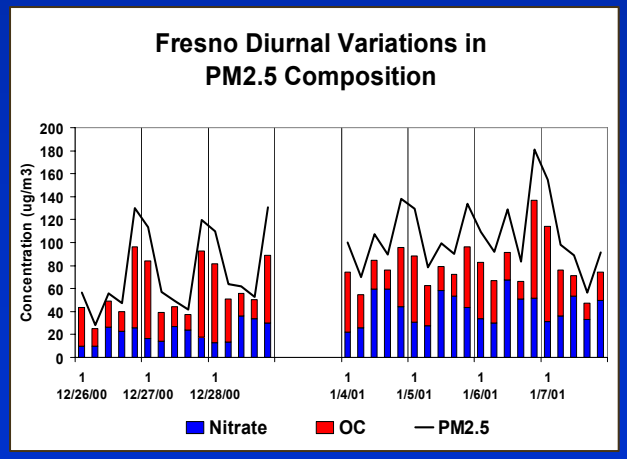
- Air Quality and Meteorology Data
  - **PM Mass and Chemical Species**
  - **Visibility**
  - **Surface and Aloft Meteorology**
- Emissions Inventory Projects
  - **Transportation Network and Activity**
  - **Spatial Data and Micro-inventory**
  - **Ammonia Inventory**
  - **Selected Speciation Profiles**

CRPAQS
Analysis of site and episode characteristics

- Data Analysis
  - **Characterization of Episodes**
  - **Representativeness of Episodes**
- Air Quality Modeling
  - **Grid-based Modeling of IMS95 and 2000-2001**

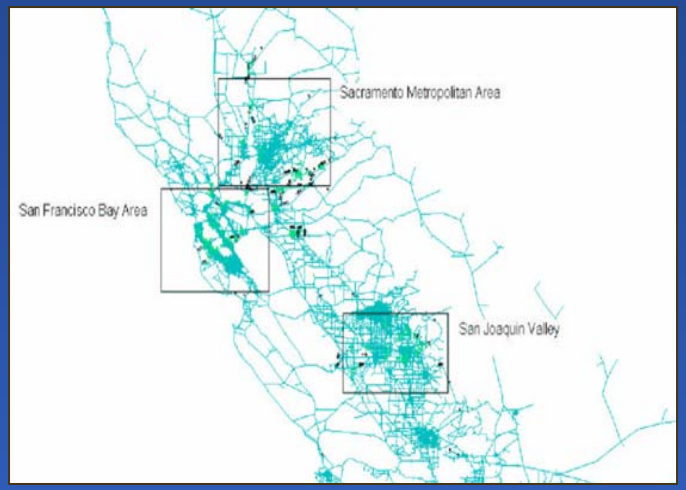
CRPAQS Data Analysis





- Temporal and Spatial Variations
- Meteorology and Transport
- Atmospheric Processes
- Representativeness
- Source Contributions

Emissions Inventory



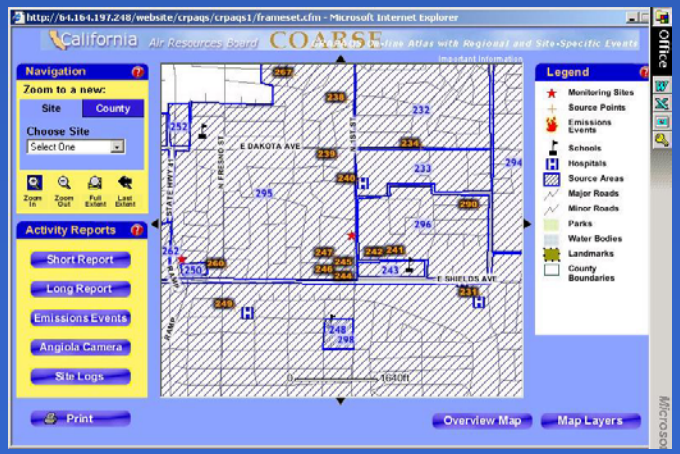
Motor Vehicle Activity Data

Transportation Network Integration

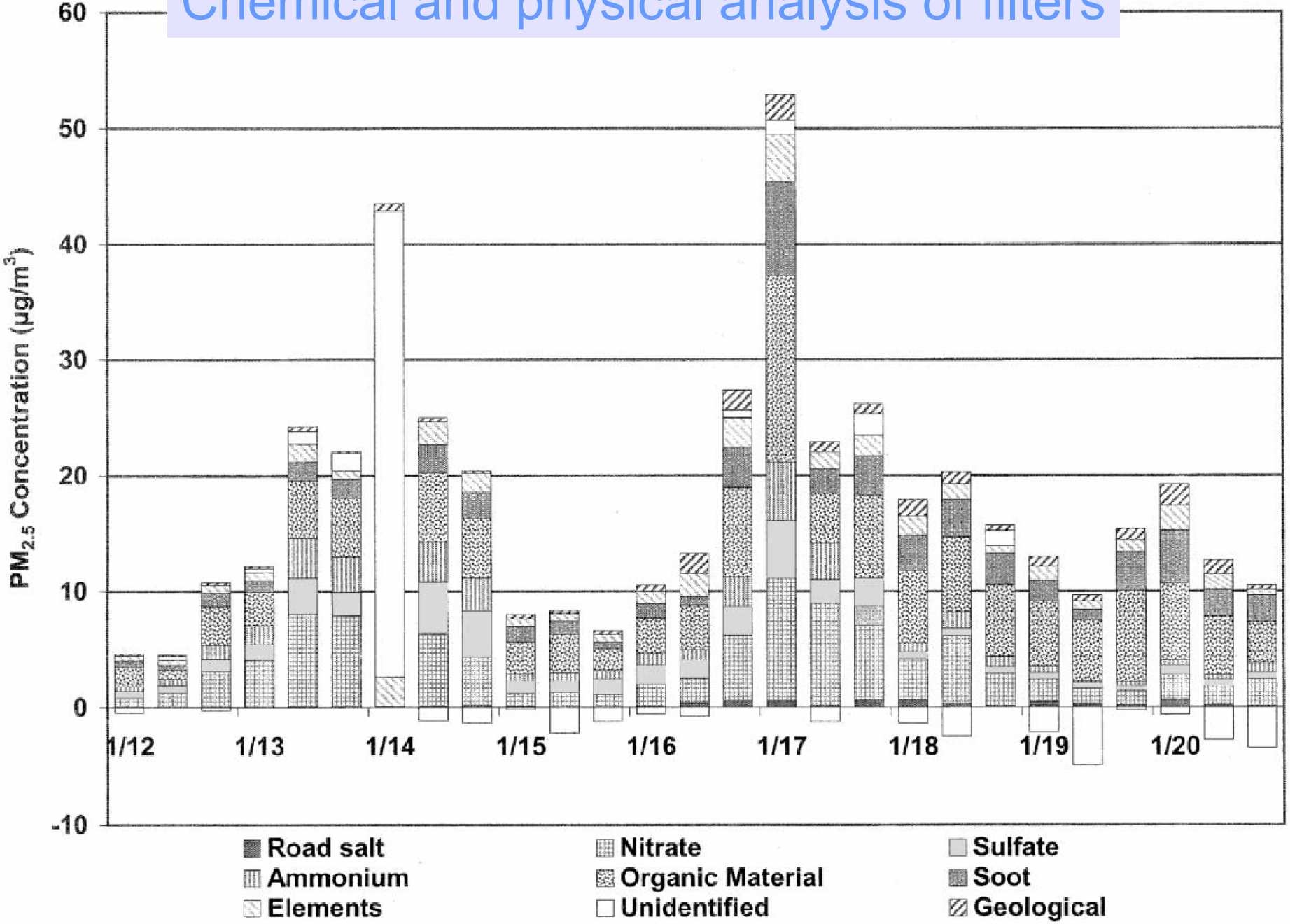
Speciation Profiles

Spatial Data & Micro-inventory

Ammonia Emissions



Chemical and physical analysis of filters



Identification of source profiles

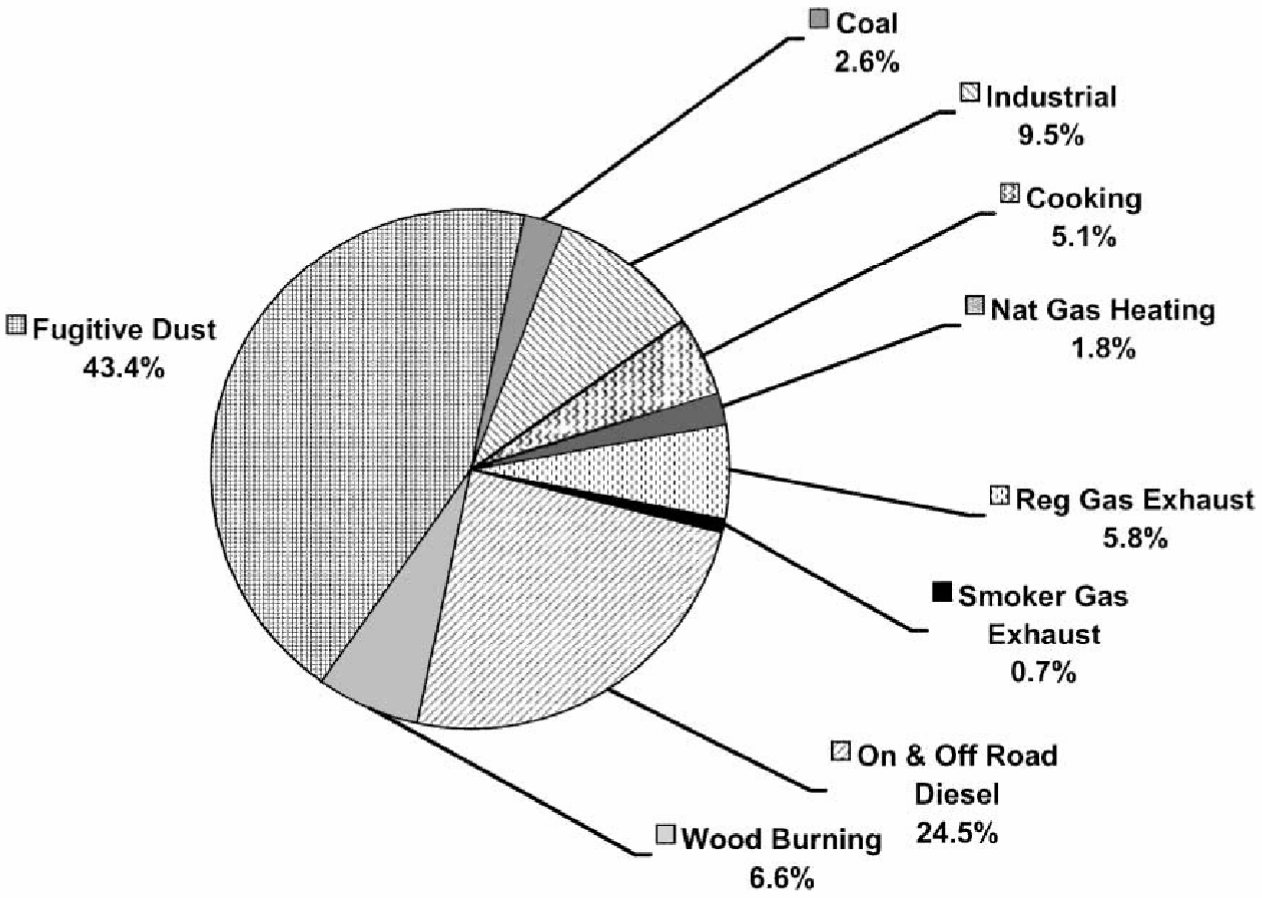


Fig. 1. $PM_{2.5}$ emissions from Table 2 are combined into categories that might be resolved by receptor models. Paved road dust, unpaved road dust, and construction emissions are summed, as are on-road and off-road diesel emissions.

Identify goal

Are you trying to identify common contributing components? Use the same profiles and see how much of the sample they explain

Are you trying to determine variation of contributing sources? Select site and event specific profiles

CMB Preparation Process
Episode identification
Episode Met analysis
Episode Chemistry
Initial CMB tests
Episode data subsets
Back Trajectories -24 hr
Backward & forward trajectories
Wind roses
Profile closeness matrix
Ag Burn activity
Profile database analysis
Profile spreadsheet groupings
Maps for profile selection
Calendar activity data collection
EI data
Calendar activity data selection
Episode synthesis of all elements
Final Profile selection and weighting
Final CMB modeling

CMB Process Preparation	
day specific concentration	PM10 values for exceedances
burn status	burn, no burn plus mention of likelihood of RWC
windflow	description of contributing areas
day specific chemistry	ARB
meteorology	District synoptic meterology analysis
	trajectory analysis
profile selection	start with generic selection
standard items	ID ones used for all analyses
calendar - area specific	consider all contributing areas and calendar period

Microsoft Access - [InteractiveTrajectoryPlot : Form]

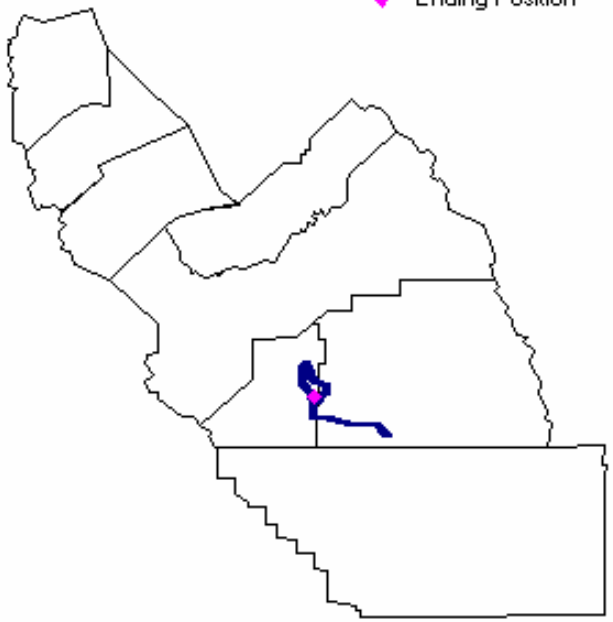
File Edit View Insert Format Records Tools Window Help

Backward Trajectory

Trajectory Start Time 1/4/2001 Hour: 0

Trajectory End Time 1/4/2001 Hour: 23

Ending Position



STOP

Output data to an XLS file

Form View

Microsoft Access - [InteractiveTrajectoryPlot : Form]

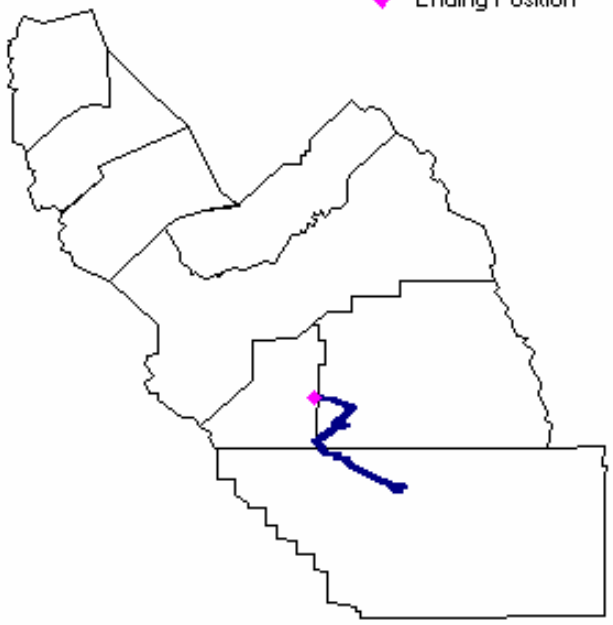
File Edit View Insert Format Records Tools Window Help

Backward Trajectory

Trajectory Start Time 1/7/2001 Hour: 0

Trajectory End Time 1/7/2001 Hour: 23

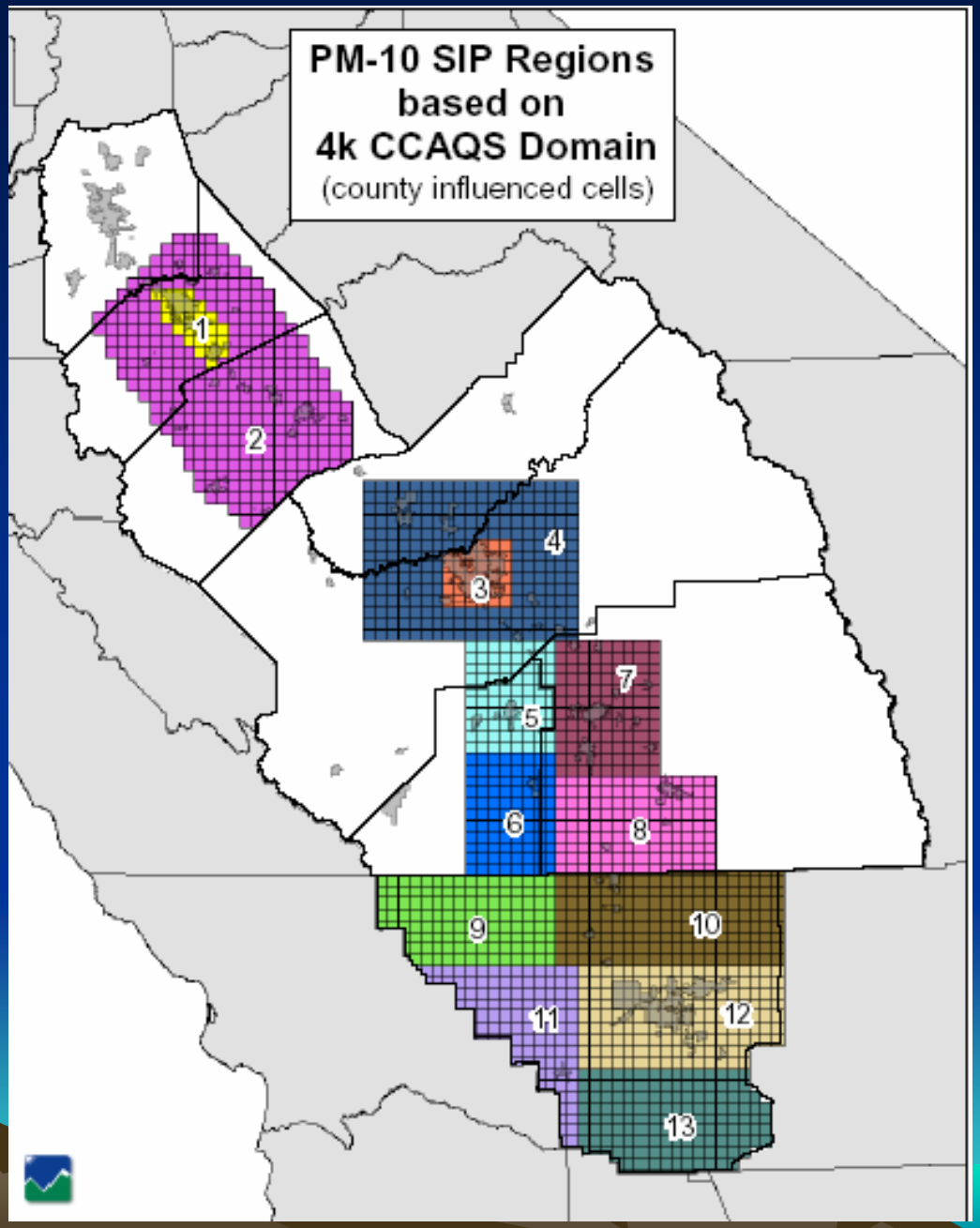
♦ Ending Position



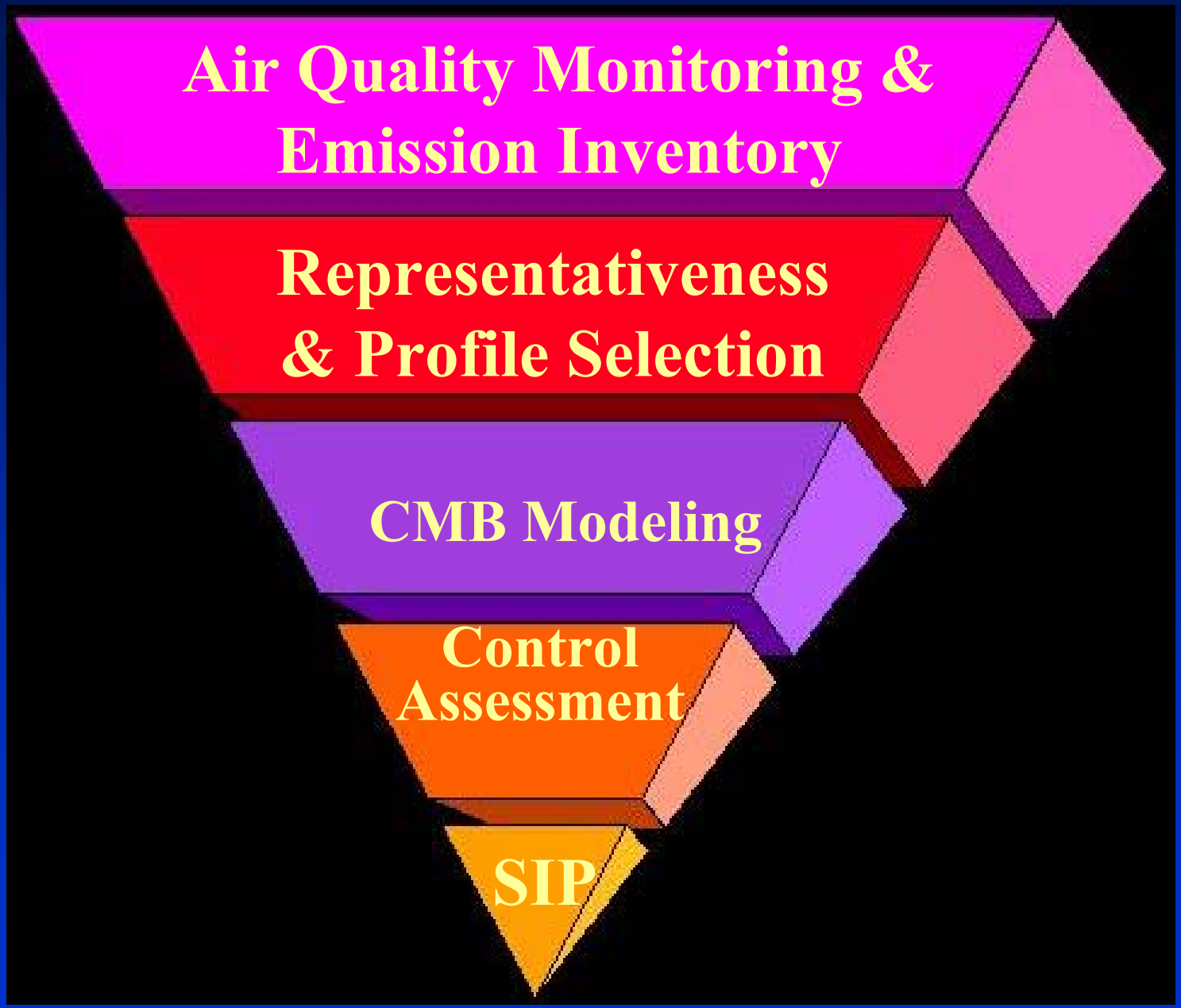
STOP

Output data to an XLS file

Form View


PM-10 SIP Regions
based on
4k CCAQS Domain
(county influenced cells)
1
2
3
4
5
6
7
8
9
10
11
12
13


Clean Air
SIP
Control Assessment
CMB Modeling & Data Analysis
Emission Inventory
Air Quality Monitoring


Air Quality Monitoring &
Emission Inventory
Representativeness
& Profile Selection
CMB Modeling
Control
Assessment
SIP

Planning

- **Determine Study Questions**
  - What are the specific sources which contribute to PM exceedances?
  - Are exceedances local or regional in nature, or a combination of both?
  - Will the same strategies be effective for both the annual and the 24-hour standards?

Questions?

What other technical issues have been identified by CMB users?

- Charbroiling emissions
- Selection of MV fuels profiles
- Speciation profile combinations, averaging and weighting

Receptor modeling application framework for particle source apportionment

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John G. Watson, Tan Zhu, Judith C. Chow, Johann Engelbrecht, Eric M. Fujita, William E. Wilson
Desert Research Institute, Division of Atmospheric Sciences, 2215 Raggio Parkway, Reno, NV 89512,
Nankai University, Environmental Science and Engineering Institute, Tianjin 300071, Peoples Republic of China
US Environmental Protection Agency, Research Triangle Park, NC 27711